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Recommended Citation
Ayna Beate Johansen, Annmarie Cano
A preliminary investigation of affective interaction in chronic pain couples
PAIN, Volume 132, Supplement 1, November 2007, Pages S86–S95
http://dx.doi.org/10.1016/j.pain.2007.04.016
Available at: http://digitalcommons.wayne.edu/psychfrp/9

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Pain. Author manuscript; available in PMC 2007 November 30.

Published in final edited form as:
Pain. 2007 November ; 132(Suppl 1): S86–S95.

A Preliminary Investigation of Affective Interaction in Chronic Pain Couples

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Abstract

The objective of this preliminary study was to examine the extent to which affective marital interaction related to depressive symptoms in persons with chronic pain and their spouses and to pain severity in persons with pain. Couples from the community completed self-report surveys and engaged in a videotaped conversation on a topic of mutual disagreement that was coded for three affect types (i.e., anger/contempt, sadness, humor). Humor was positively related to marital satisfaction in both partners. Spouse anger/contempt and sadness were positively related to depressive symptoms in spouses. Several significant interaction effects between couple pain status (i.e., whether one or both partners reported pain) and affect also emerged. Specifically, sadness in the participant designated as the *person with pain* was associated with greater depressive symptoms and pain severity when only he or she reported pain whereas sadness was related to fewer depressive symptoms and less pain severity when both partners reported pain. The relationships between spouse anger and spouse depressive symptoms and between spouse humor and pain severity in the person with pain were also moderated by couple pain status. These exploratory findings can be interpreted in light of emotion regulation and pain empathy theories. For example, partners who have not experienced pain themselves may fail to empathize with persons in pain, thus preventing effective emotion regulation. When both spouses report chronic pain, expressions of negative affect may instead promote emotion regulation because the affect is experienced with a spouse who may be more empathetic.

1. Introduction

Spousal reinforcement of pain behaviors, marital satisfaction, and support are correlates of pain and depression in chronic pain couples (see Leonard et al., 2006 for a review). These results support operant and cognitive-behavioral conceptualizations of pain (Fordyce, 1976; Turk et al., 1983). Consequently, researchers have tested treatments targeting spousal reinforcement and support (Keefe et al., 1999, 2004). Recent work, however, has indicated that current behavioral conceptualizations may not fully account for the role of relationships in pain (Newton-John & Williams, 2006). Therefore, additional relationship variables may provide clues about other intervention strategies that could be pursued. The purpose of this study was to examine couple interaction as one such variable.

Negative marital interaction is thought to act as punishment for engaging with one's partner, reducing interaction frequency, and contributing to less intimacy and greater psychological distress (Beach et al., 1990). Indeed, negative affect expressed during interaction (e.g., anger, contempt, criticism) is associated with marital distress (Gottman et al., 1998), depression

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(Johnson & Jacob, 1997; Ruscher & Gotlib, 1988; Schmaling et al., 1991), and marital dissolution (Gottman & Krokoff, 1989; Smith et al., 1990; Gottman, 1994) in physically healthy couples. According to emotion regulation theory, marital interaction may also influence one's ability to manage his or her own emotions (Fruzzetti & Iverson, 2006). It is conceivable that negative marital interaction may also relate to one's ability to regulate other experiences including pain, which includes an affective component (Melzack & Casey, 1968). Furthermore, marital interaction may be associated with the partner's regulation of mood and pain.

To date, interaction research in the pain literature has focused on pain-related reinforcement and has clearly informed theory and intervention. However, reinforcement does not occur solely in the context of pain behaviors. Spouses are also exposed to contingencies that affect their mood during general marital interactions about parenting, finances, and household chores, which are also likely to be more frequent than pain behavior-reinforcement exchanges. Furthermore, the affective quality of interactions is not fully accounted for by existing pain interaction research. Affect expressed during interactions may have an important emotion regulation function for chronic pain couples. In the current study, affective interaction was assessed during a general marital interaction to provide a first step toward investigating the role of affective communication in chronic pain couples.

Following theory and research, it was expected that observed negative affect (i.e., anger, contempt, sadness) during marital interaction would relate positively to chronic pain couples' depressive symptoms. Positive affect (i.e., humor) was expected to relate negatively to symptoms. It was also expected that marital interaction would relate to pain severity in a similar manner. Last, couple pain status (i.e., one partner versus both partners report chronic pain) was explored as a moderator. Increased personal knowledge of pain may increase a partner's sense of knowing about pain in his or her spouse and perhaps a more empathic response (Goubert et al., 2005). Thus, affect may relate to depressive symptoms and pain as a function of the spouse's personal experience with the pain.

2. Method

2.1 Participants

Participants were 79 individuals with chronic pain and their spouses who were recruited from a large metropolitan area in the Midwestern United States. The sample included 34 male and 45 female persons with pain and their spouses. Couples were married for an average of 22.64 years (*SD* = 13.61). The majority of the sample was Caucasian (person with pain *n* = 41, 51.9%; spouse *n* = 39, 49.4%) but a number of the persons with pain and their spouses self-identified as African American (person with pain *n* = 31, 39.2%; spouse *n* = 34, 43%) and other races and ethnicities (e.g., Asian, Hispanic/Latino; person with pain *n* = 7, 8.9%; spouse *n* = 6, 7.7 %). Persons with pain and their spouses were, on average, middle-aged (*M* = 53.46, *SD* = 12.07 and *M* = 54.44, *SD* = 12.41, respectively). Mean education in years was 13.87 (*SD* = 2.79) for persons with pain and 14.19 (*SD* = 2.51) for their spouses. Most participants reported back pain (*n* = 58, 74%) and knee, leg, or foot pain (*n* = 58, 74%), followed by neck and shoulder pain (*n* = 38, 48%), arm and hand pain (*n* = 18, 23%) and pain in other areas (*n* = 6, 8%). The percentages do not sum to 100% because many participants reported more than one pain site. The most common diagnoses for persons with pain were Osteoarthritis (*n* = 25, 32.1%) and spine or back problems (*n* = 14, 17.9 %) and their mean pain duration was 9.83 years (*SD* = 10.55). Many spouses also reported chronic pain (*n* = 38). The most frequently reported pain sites included knee, leg, or foot (*n* = 29, 76%), back (*n* = 22, 58%), neck and shoulders (*n* = 13, 34%), and arms, hands, and other sites (*n* = 4, 11%). The most common diagnosis for spouses was Osteoarthritis (*n* = 22, 58%) and spouses with pain reported a mean pain duration of 9.46 years (*SD* = 7.61).

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Couples were eligible if at least one spouse had a current, chronic musculoskeletal pain problem that had lasted for at least six months almost daily. Each spouse had to be at least 21 years old. Couples not legally married but living together for the past 2 years were also eligible. In cases where both spouses had a chronic musculoskeletal pain condition, the spouse with the most severe or disabling pain by both partners' reports was identified as the "person with pain." Systemic pain conditions (e.g., rheumatoid arthritis) and terminal illness (e.g., cancer, positive HIV status, AIDS) in the persons with pain were excluded from the study because of the possibility that these pain conditions relate to mood and relationships in a different manner. These conditions could be present in the spouse, however. Couples were also excluded if either spouse exhibited poor cognitive functioning as indicated on a phone adaptation of the Mini Mental Status Exam (MMSE; Folstein, Folstein, & McHugh, 1975) or reported current psychotic symptoms from the Structured Clinical Interview for the DSM-IV (First, Spitzer, Gibbon, & Williams, 1995). No participants from the current sample had any reported difficulties understanding written or spoken English, nor did they exhibit any condition(s) that could prevent them from successfully completing written surveys.

2.2 Measures

The *Specific Affect Coding System* (SPAFF; Gottman, McCoy, & Coan, 1996) was used to measure observed marital interaction. The SPAFF is a gestalt coding system that utilizes context, voice tone, physical features (facial gestures, and body movement) and cultural specific data for coding. The SPAFF discriminates well between discordant and non-discordant couples, and evidences excellent construct and criterion validity (Heyman, 2001). Couples can exhibit negative SPAFF codes including contempt, anger, and sadness, and yet report that they are maritally satisfied. Nevertheless, couples expressing high levels of negative affect typically report discontent and eventually divorce (Gottman et al., 1998). In a recent factor analysis, the SPAFF yielded four distinct factors including anger/contempt, sadness, humor, and fear (Johnson, 2002). These factors also make sense theoretically. Gottman et al. (1998) conceptualized anger and contempt as high intensity negative affect that purportedly has a more destructive impact and sadness as low intensity negative affect. In contrast, shared humor is conceptualized as an indicator of a stable, happy relationship. Therefore, we limit our investigation to a combined anger/contempt code, as well as separate codes of sadness, humor, and fear.

Speaker turns are the original units of coding and analysis intended for the SPAFF, and chosen for the study because they allow for calculation of both proportion of positive or negative affect to overall affect and proportion of individual codes to overall affect. Although 5-second intervals is another commonly used unit of analysis that may, in some instances (in the event of very long speaker turns), lower the possibility of multiple expressions of codes in a given unit (Johnson, 2002), this method was not chosen as the current sample appeared to produce comparable numbers of units of speaker turns and intervals. For example, the average length of each speaker turn was 5.09 seconds while the range was .01 – 42 seconds for a subset of the sample (n = 25) that was generated from the first 25 consecutive tapes of the study. Hence, it appears that using speaker turns is appropriate for this study. Affect was calculated as the proportion of either anger, contempt, sadness or humor codes divided by total affect (positive, negative, and neutral) for each individual spouse. In other words, scores reflect the percentage of time over the 15-minute interaction that each affect code was expressed.

Coders were undergraduate and graduate students trained on the SPAFF system with readings, audiotapes, and videotapes. The authors held weekly training meetings with the coders. Training included reading Ekman & Friesen's (1975) book *Unmasking the Face*, and the SPAFF manual (Gottman, McCoy, Coan, & Collier, 1996). The first two sessions of training were designed to introduce and describe the SPAFF codes. Next, the assistants listened to the

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audiotapes that accompanied the SPAFF manual to learn differentiation of voice quality, and attended a separate session to practice facial coding. Following this introduction to coding, the assistants coded all the training videotapes over the course of the next 2 – 3 months, as well as a selection of scenes deemed to be representative of different codes displayed in a pilot sample of couples. The weekly meetings also included discussion of any discrepancies in coding. An average of 60 hours of active coding was completed before reaching reliability with a master coder on the SPAFF. When coders reached adequate reliability (i.e., kappa > .60) on the pilot data, they were deemed fully prepared for coding. A total of three cohorts of assistants were recruited. The reliable research assistants included two graduate, one post-baccalaureate, and six advanced undergraduate students. Seven additional undergraduates were recruited for SPAFF coding but did not complete the training for different reasons including relocation of residence, as well as failure to reach reliability.

Inter-rater reliability for SPAFF codes in the current study was computed using Kappa coefficients. The assistants remained blind at all times to which couples were coded by more than one person in order to prevent over-estimation of the kappa value. Coders were also blind to spouses' marital satisfaction, pain severity, and psychological distress. A total of 54% of the tapes were coded by two or more coders in order to facilitate reliability analyses, but only tapes in which a given code was reported at least three times by at least one of the raters were included in producing the overall kappa coefficients. Thus, a total of 12, 17, 14, and 36 tapes were included in calculating the kappas for contempt, anger, sadness, and humor respectively, and their kappas were .58, .65, .60, and .70 respectively. This constitutes strong to excellent inter-rater reliability according to Cohen (1960). However, inter-rater reliability for fear was unacceptable (kappa = .33). Therefore, fear was not included in further analyses.

The negative codes including contempt, anger, and sadness were observed in numbers of speaker turns ranging from 0–28, contempt; 0–26, anger; and 0–16, sadness, and these scales were positively skewed. Recall that we combined the codes of contempt and anger due to theoretical and recent factor analytic findings. Anger/contempt was observed in 64% of persons with pain and 59% of their spouses. Sadness was observed in 43% of both partners. The extreme skewness of the anger/contempt and sadness codes could not be adequately corrected with statistical transformations. Given the fairly even split between the number of couples with and without these affect codes, anger/contempt and sadness were dichotomized (i.e., presence vs. absence) for use in further analyses. Humor was normally distributed and ranged in numbers of speaker turns from 0–100, with 93% of partners displaying humor at least once. Nevertheless, we dichotomized humor as well because it would have been difficult to interpret the associations between affect codes if only some were dichotomized. Likewise, it would have been difficult to compare results from regression analyses (humor) with Analyses of Variance (ANOVA; anger/contempt, sadness). Upon examination of the data, the median percentage of humor for persons with pain and their spouses were 6% and 7% of the time, respectively. To keep the measures of humor parallel as across partners, humor was dichotomized into 2 groups: partners who engaged in humor at least 7% of the time (44% persons with pain; 49% spouses) and those who engaged in humor less than 7% of the time.

The examination of gender and race as independent variables of interest is beyond the scope of this study. Nevertheless, we conducted analyses to determine if there were group differences in all of the variables included in this study to inform research regarding diverse samples. There were no racial or gender group differences in the affect codes with the exception of spouse sadness, Spearman's rho = −.30, $p < .01$. Significantly more wives (42%) of persons with pain expressed sadness at least once compared to husbands (16%) of persons with pain.

Marital satisfaction was assessed with the *Dyadic Adjustment Scale* (Spanier, 1976), a 32-item self-report measure of marital satisfaction that includes items that tap spousal agreement on

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various topics (e.g., finances, time spent together, sex), intimacy, and overall happiness in the marriage. The Dyadic Adjustment Scale was included in the current study as a dependent variable to determine the extent to which 1) existing SPAFF results extend to a chronic pain couple sample and 2) SPAFF codes relate to depressive symptoms and pain severity after adjusting for marital satisfaction. Higher scores indicate greater marital satisfaction. The DAS was normally distributed and inter-item reliabilities in the current sample were excellent (person with pain $\alpha = 0.95$, spouse $\alpha = 0.92$). The sample was maritally satisfied on average (Persons with pain M = 109.10, SD = 21.67, Spouses M = 110.00, SD = 18.13). There were no significant gender differences in marital satisfaction but there were racial group differences which has been found in the literature (Broman, 1993). African-American persons with pain and their spouses reported significantly lower marital satisfaction (Persons with pain M = 102.02, SD = 18.70, Spouses M = 105.37, SD = 19.20) than Caucasian persons with pain and their spouses (Persons with pain M = 115.72, SD = 21.11, Spouses M = 114.73, SD = 16.77), t (69) = 2.85 and t (69) = 2.19, ps <.05.

The Mood and Anxiety Symptom Questionnaire (MASQ; Watson & Clark, 1991) was used to assess depressive symptoms because it assesses two types of depressive symptoms. The General Distress: Depression subscale (12 items) was used to measure diffuse symptoms of depression (e.g., disappointment, self-blame, hopelessness, sadness, worthlessness). The Anhedonic Depression subscale (22 items) was used to measure loss of interest and low positive affect, symptoms that are often not well-represented on other depressive symptom scales. In fact, many depressive symptom measures include symptoms of anxiety so it is not clear whether true depressive symptoms have been assessed. In addition, the MASQ, which has often been used in community samples, was chosen over other scales because the current sample was a community sample. The MASQ has good convergent and discriminant validity, reliability, and a stable factor structure in a variety of samples including clinical and community samples of persons with chronic pain (Geisser et al., 2006; Watson et al., 1995a,b). In the current study these scales were highly correlated with one another for both persons with pain ($r = .77$, $p < .01$) and spouses ($r = .74$, $p < .01$). Therefore, all analyses were conducted with a composite depression variable computed by summing the two subscales to reduce Type I error. The reliability for the composite depression variable was excellent for persons with pain ($\alpha = .96$) and spouses ($\alpha = .96$) and the scores were normally distributed. Mean depressive symptoms for persons in pain and their spouses were 80.51 (SD = 25.92) and 72.88 (SD = 22.32), respectively, which was a significant difference, t (75) = 2.76, $p < .01$. The spouse mean is similar to means obtained by Watson et al.(1995a) in an adult community sample (Ms = 74 – 77) whereas the mean for persons with pain is slightly higher, as one would expect. There were no racial or gender group differences in depressive symptoms.

The *Multidimensional Pain Inventory (MPI)* (Kerns, Turk, & Rudy, 1985) and the *Multidimensional Pain Inventory-Spouse Version (MPI-S)* (Flor, Kerns, & Turk, 1987) were used to measure reports of pain severity in the identified person with pain. The 3-item pain severity subscale assesses pain at the current moment, the average severity, and amount of suffering the individual experiences on a 7-point likert-type scale ranging from 0 to 6. Pain severity is calculated from the mean of the 3 items. Persons with pain and their spouses reported that the former were, on average, experiencing moderate amounts of pain ($M = 3.67$, $SD = 1.26$ and $M = 3.62$, SD = 1.27, respectively). Pain severity ratings were normally distributed in this sample. There were no gender differences in pain ratings. As found by other researchers (Green et al., 2004; Riley et al., 2002), African-American persons with pain reported higher pain severity, M = 4.06 (SD = 1.38), than Caucasian persons with pain, M = 3.36 (SD = 1.17), t (69) = −2.34, p < .05. A racial group difference was not observed in the spouses' pain ratings. The inter-item reliabilities for the current sample were excellent for both persons with pain and their spouses (αs = .80 and .81, respectively).

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2.3 Procedure

Couples were recruited from newspaper advertisements and were informed that the purpose of the study was to understand the positive experiences and problems encountered by couples in which one or both spouses are experiencing chronic pain. Eligible couples attended a 3-hour lab session during which they completed consent forms, surveys, and interviews. Following these tasks, the couples engaged in a 15-minute discussion about a topic of disagreement of their choosing (e.g., household chores, finances, expressions of affection, sexual intimacy). Prior to the interaction, a trained research assistant assisted each couple in identifying a topic on which they would frequently disagree by examining their responses on the first 15 items of the Dyadic Adjustment Scale. No instructions were given on the pain relevance of the topic. The assistant then briefly interviewed each spouse about their concerns and opinions regarding the topic following Hooven et al. (1996). The assistant instructed the couple to make some progress toward agreement. This is a standard marital interaction task in couples research. The most commonly chosen topics were household chores (n = 15, 19%), finances (n = 13, 17%), children and parenting (n = 13, 17%), affection and intimacy (n = 10, 13%), leisure time (n = 8, 10%), and lifestyle (e.g., exercise, drinking behavior, desire to move away; n = 6, 8%). Each of the following topics occurred in less than 7% of couples: sex, relatives, work, communication, power, and religion. The topics identified by the pain couples were similar to those identified by non-pain community couples in other studies (e.g., Sanford, 2003).

After completion of the interaction task, the couples were debriefed and were compensated $100 for their time. Couples were not promised treatment or referral for specific problems but they all received a referral list consisting of psychological and medical professionals as a public service.

2.4 Data Analysis

Upon screening the data for nonrandom missing data and outliers, one couple was excluded because it was a univariate outlier on spouse sadness at the .05 level of significance. Because of some random missing data (e.g., person with pain and one spouse [not in the same couple] neglected to complete the depressive symptom measures), the sample sizes ranged from 77 to 78 couples.

Correlations were conducted to examine the bivariate relationships among affect codes. T-tests were then conducted to examine the bivariate associations of affect codes to depressive symptoms and pain severity. Last, Analyses of Variance (ANOVA) were conducted on each dependent variable (i.e., depressive symptoms in both partners, pain severity in the person with pain). ANOVAs included significant covariates, the main effects of each spouse's affect and couple pain status (person with pain only has chronic pain vs. both partners report chronic pain), and all two-way interaction terms between the main effects. Three-way interactions were not examined due to the number of variables entered into the analyses. Alpha was set to .05 for all analyses because of the preliminary nature of the investigation. Due to space considerations only analyses with significant interaction terms are presented. Complete analyses are available from the second author.

3. Results

3.1 Associations among affect codes

Spearman's rho correlation was chosen to examine the associations between affect codes because these variables were ordinal in nature. Table 1 shows that the three affect codes were positively correlated within couples (e.g., anger/contempt in person with pain was correlated positively with anger/contempt in their spouses). The particularly high humor correlation is probably due to the fact that the SPAFF coding manual requires both partners to react to

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humorous expressions in a positive way. Humor in one partner that was not accepted by the other would have been coded as negative affect.

Table 1 also displays the correlations among affect codes within each partner, which provides some information regarding discrimination among the codes. One would expect the negative affect codes to be positively correlated with each other but negatively correlated with humor, a positive affect code. For persons with pain, anger/contempt was positively, but not significantly, related to sadness. For spouses, anger/contempt was positively and significantly correlated with sadness. Both negative affect codes were negatively, but not significantly, correlated with humor in both partners. Although some of these correlations were not significant, they were all in the theoretically predicted direction, which provides some support for the discrimination between affect codes.

Cross-affect, cross-partner correlations were also examined but are not displayed in Table 1. Specifically, anger/contempt in persons with pain was not significantly correlated with spouse sadness (*rho* = .09, $p > .40$). However, anger/contempt and sadness in persons with pain was negatively associated with humor in their spouses although the sadness correlation was not significant (*rho* = −.29, $p < .05$ and *rho* = −.19, $p < .11$, respectively). In contrast, anger/contempt in spouses was significantly correlated with sadness in persons with pain (*rho* = .33, $p < .01$). Anger/contempt and sadness in spouses was negatively but not significantly associated with humor in persons with pain (*rho* = −.16 and *rho* = −.07, $p > .16$, respectively). Again, these correlations were in the expected direction.

3.2 Associations of affect codes with marital satisfaction, depressive symptoms, and pain severity

T-tests were then performed to assess the relationships of the three affect codes (i.e., anger/contempt, sadness, humor) to marital satisfaction, pain severity, and depressive symptoms (see Table 2). Humor was positively associated with marital satisfaction in both partners. Specifically, spouses reported significantly greater marital satisfaction when they or the persons with pain engaged in humor at least 7% of the time (*M* = 114.99, *SD* = 20.53; *M* = 115.04, *SD* = 18.80, respectively) than when they or the persons with pain expressed humor less than 7% of the time (*M* = 105.22, *SD* = 14.20; *M* = 106.07, *SD* = 16.77, respectively). The effect sizes for humor of the spouse and person with pain were medium (Cohen's d = .56 and .51, respectively). For persons with pain, this effect was limited to their own expressions of humor (High Humor *M* = 114.59, *SD* = 18.17; Low Humor *M* = 104.86, *SD* = 23.36), also a medium effect (Cohen's d = .46). The presence of sadness in spouses was significantly associated with lower marital satisfaction (Sadness *M* = 102.17, *SD* = 19.55; No Sadness *M* = 112.86, *SD* = 16.86), a medium effect (Cohen's d = .55).

None of the affect codes were significantly associated with depressive symptoms in persons with pain. However, the presence of anger/contempt or sadness in the spouse was significantly related to greater depressive symptoms (Anger/Contempt *M* = 78.11, *SD* = 24.56; No Anger/Contempt *M* = 65.13, *SD* = 15.93 and Sadness *M* = 83.33, *SD* = 24.60; No Sadness *M* = 68.96, *SD* = 20.28, respectively). Both of these effects were medium (Cohen's d = .60 and .60, respectively). To put these depressive symptom scores in context, the mean depressive symptom scores in an adult community sample ranged from 74 to 77 whereas the mean score for a sample seeking outpatient treatment for substance abuse was 93 (Watson et al., 1995a). Therefore, the absence of anger and sadness appear to be related to fewer than expected depressive symptoms.

Affect codes were not significantly related to pain severity ratings made by the persons in pain. However, anger/contempt in persons with pain was significantly related to their spouses' rating of their pain such that the presence of anger/contempt was related to higher spouse ratings of

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pain severity in the persons with pain (Anger/Contempt $M = 3.85$, $SD = 1.23$; No Anger/Contempt $M = 3.20$, $SD = 1.25$), a medium effect (Cohen's d = .51).

3.3 Analyses of Variance

3.31 Depressive Symptoms in Persons with Pain—Marriage duration, education, and pain severity correlated significantly with depressive symptoms in persons with pain ($r = -.30$, $p < .01$; $r = -.40$, $p < .01$; $r = .33$, $p = < .01$, respectively). Marital satisfaction was also significantly correlated with depressive symptoms ($r = -.41$, $p < .001$). Therefore, these variables were entered as covariates in the subsequent ANOVAs with depressive symptoms as the outcome variable. The inclusion of marital satisfaction is particularly important to determine whether the interaction variables related to depressive symptoms beyond the effect of marital satisfaction.

Table 3 demonstrates a significant interaction between couple pain status and sadness in the person with pain that accounts for approximately 8% of the variance in depressive symptoms. T-tests demonstrated that the presence of sadness was associated with greater depressive symptoms in persons with pain when only that partner reported chronic pain, $t\,(36) = -2.80$, $p < .01$, a large effect (Cohen's d = .93). However, the presence of sadness was correlated with fewer depressive symptoms when both partners reported chronic pain, $t\,(37) = 2.78$, $p < .01$, also a large effect (Cohen's d = .91). One might argue that the significant interaction between couple sadness and depressive symptoms may be due to the presence of sadness items in the depression measure. As a check, these analyses were repeated after removing 3 items from the MASQ depressive symptom measure that tap sadness. The reanalysis resulted in the same significant interactions, suggesting that couple sadness is not tapping the same construct as depressive symptoms. The other affect codes did not interact with couple pain status in relating to depressive symptoms.

3.32 Spouse Depressive Symptoms—Education and marital satisfaction were correlated significantly with depressive symptoms in spouses ($r = -.20$, $p < .05$ and $r = -.41$, $p < .0001$, respectively). Therefore, these variables were entered as covariates in the following ANOVA.

Spouse anger/contempt interacted with couple pain status to account for a significant portion of the variance (6%) in spouse depressive symptoms (see Table 4). The presence of anger was associated with greater depressive symptoms when only the person with pain reported chronic pain, $t\,(35) = -4.05$, $p < .001$, a large effect (Cohen's d = 1.37). Spouse anger/contempt was not related to depressive symptoms if both partners reported pain, $t\,(38) = 1.00$, $p > .90$, a small effect (Cohen's d = .32). There was also a trend for partner's anger/contempt to interact with each other. Followup analyses showed that when the person with pain did not express anger/contempt, there was no relationship between spouse anger/contempt and their depressive symptoms, $t\,(25) = -.28$, $p > .70$, a small effect (Cohen's d = .11). However, when the person with pain expressed anger/contempt, spouses who also expressed anger/contempt reported significantly more depressive symptoms than spouses who did not express anger/contempt, $t\,(48) = -2.44$, $p < .02$, a medium to large effect (Cohen's d = .70).

As described earlier, three-way interactions were not planned. However, the interesting pattern of two-way interactions led us to test an exploratory three-way interaction that might explain the two-way results. The three-way interaction was significant, $F\,(1, 67) = 4.66$, $p < .05$, partial $\text{eta}^2 = .07$. Post hoc analyses showed that spouse anger/contempt was associated with greater depressive symptoms for spouses who did not report pain but whose partners (i.e., the person with pain) expressed anger/contempt, $t\,(24) = -3.96$, $p < .001$, a large effect (Cohen's d = 1.62).

3.33 Pain Severity in Persons with Pain—Marriage duration and education were included as covariates in these ANOVAs because they were both significantly correlated with

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pain severity, ($r = -.33$, $p < .01$ and $r = -.33$, $p < .01$, respectively). Recall that African Americans reported higher pain severity than Caucasians. Self-reported race/ethnicity was included as a covariate because the group difference result held when comparing Non-Hispanic Caucasians to all other minority groups. Doing so allowed the use of the entire dataset rather than excluding participants who did not self-report as Caucasian or African American.

As shown in Table 5, sadness in the person with pain interacted with couple pain status in accounting for 6% of the variance in self-reports of pain severity. When only the person with pain reported chronic pain, sadness was associated with greater pain severity, t (36) = −1.75, $p < .09$, whereas when both partners reported a chronic pain problem, sadness was inversely related to pain severity, t (38) = 1.83, $p < .08$. Although these two t-tests were not significant, the effect sizes were medium (Cohen's d = .58 and .59, respectively). Furthermore, the significant interaction in the ANOVA demonstrates that the patterns of effects are significantly different from one another. Furthermore, the pattern of these findings is similar to that found for depressive symptoms in persons with pain.

Humor expressed by the spouse also interacted with couple pain status to predict pain severity in persons with pain, accounting for 7% of the variance (see Table 6). Specifically, spouse humor was not associated with pain severity in couples in which only the person with pain reported pain, t (36) = .39, $p > .70$, a small effect (Cohen's d = .13). However, spouse humor was positively associated with the partner's pain severity when both partners reported pain, t (38) = −1.92, $p < .06$, a medium effect (Cohen's d = .62). While we had no intentions of examining pain severity ratings made by the spouses, we conducted exploratory ANOVAs on this variable; no significant interactions were found.

4. Discussion

Pain researchers have suggested that stressful interactions may contribute to the pain-depression association (Banks & Kerns, 1996). Negative marital interaction in particular may lead to less intimacy and depressed mood (Beach et al., 1990). Negative interactions may also promote emotional dysregulation in couples (Fruzzetti & Iverson, 2006). With existing models and research in mind, we conducted a preliminary investigation into the extent to which expressions of anger/contempt, sadness, and humor during marital interaction relate to depressive symptoms and pain severity.

In the current study, affect in one partner significantly related to the same affect in the other, supporting existing research regarding reciprocity of affect (Gottman, 1980). Within spouses, anger/contempt and sadness were significantly correlated. Although other within spouse correlations were not significant, they were in the correct direction (e.g., humor was negatively related to the negative codes, negative codes were positively related to each other). Similar results were found with cross-affect, cross-partner correlations (e.g., spouse sadness was correlated with anger/contempt in persons with pain). These correlational findings provide preliminary support for the dimensions of anger/contempt, sadness, and humor codes in chronic pain couples.

Further support for the affect dimensions is found in the correlations between humor and marital satisfaction. For persons with pain, marital satisfaction was related to their expressions of humor. For spouses, marital satisfaction was related to both partners' humor. The presence of sadness in the spouse was negatively related to spouse marital satisfaction. These results extend similar findings from samples of healthy couples (Johnson, 2002) to chronic pain couples. Most of the negative affect codes were not related to marital satisfaction. This finding is inconsistent with previous literature (Gottman, & Krokoff, 1989). More research is needed to determine if this is typical of couples facing chronic pain or other chronic stressors.

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None of the affect codes related in a bivariate fashion to depressive symptoms or pain severity in persons with pain. While this finding may seem surprising given that marital interaction is thought to contribute to emotion regulation, some of these relationships were moderated by whether the spouses also reported chronic pain, as discussed below. For spouses, the presence of sadness was correlated with greater depressive symptoms, supporting emotion regulation theory and existing couples research (Johnson & Jacob, 1977; Ruscher & Gotlib, 1988). This relationship held even when using a modified version of the depressive symptom measure that excluded sadness items. Finally, we found that the presence of anger/contempt in the person with pain was related to greater ratings of their pain made by their spouses. This finding suggests that spouses may attend to a variety of cues when estimating the pain of their partners including verbal, non-verbal, and non-pain specific information. In this case, irritability and anger may be attributed to pain rather than to other characteristics (e.g., my spouse is a grumpy person). The correlational nature of these findings demands that additional research be conducted to determine whether spouses' ratings of their partners' pain result in specific affective interaction patterns, whether marital interaction gives clues to spouses about the severity of their partners' pain, or both.

Findings with implications for models of emotion regulation and pain empathy emerged when we explored the possible moderating effect of couple pain status. While none of the affect codes were correlated with depressive symptoms or pain severity in persons with pain, we found that couple pain status moderated the effect of sadness. For persons with pain, the presence of sadness was associated with greater depressive symptoms and pain severity when only they themselves reported pain. It is possible that greater pain and depressive symptoms adversely affect communication style, which is consistent with research on depressed spouses (Johnson & Jacob, 1997; Ruscher & Gotlib, 1988). Sadness may also be a result of not feeling understood by one's spouse, resulting in poor emotion and mood regulation. In contrast, the presence of sadness was related to fewer depressive symptoms and less pain when both partners reported pain. This finding stands in stark contrast to research on negative marital interaction and mood (Johnson & Jacob, 1977; Ruscher & Gotlib, 1988). Perhaps there is a greater mutual understanding or sense of knowing of partners' experiences in couples in which both partners experience pain (Goubert et al., 2005) that results in feeling validated by one's spouse and in better emotion regulation despite momentary expressions of sadness.

Other evidence for the possibility of an empathic response by spouses who also experience pain comes from the significant interaction between spouse humor and couple pain status on pain severity. Spouse humor was related to greater pain severity in the person with pain when both partners reported pain but spouse humor was not related to pain severity when only one partner reported pain. Persons with pain who interpret their partners' humor as minimizing their thoughts and feelings may engage in poor emotion regulation, leading to increased pain severity. However, this explanation is not likely because humor was only coded when both partners showed positive affect as a result of the humorous utterance. Alternatively, spouses with their own pain may engage in humor as an attempt to help regulate the emotions of the person with pain, whose pain is more severe.

Findings with spouse depressive symptoms also contribute to the emerging picture of affective interaction in chronic pain couples. While sadness was related to spouses' depressive symptoms regardless of couple pain status, anger/contempt interacted with couple pain status. The presence of anger/contempt was associated with greater depressive symptoms when only the person with pain reported pain. We also found a trend for partners' anger/contempt to interact such that spouse anger/contempt was positively associated with depressive symptoms only when their partners (i.e., persons with pain) also engaged in anger/contempt. These two interactions suggested a three-way interaction between both partners' affect and couple pain status that, when explored further, was significant. Thus, spouse anger/contempt was associated

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with greater depressive symptoms for spouses without pain but whose partners (i.e., partners with pain) expressed anger/contempt. This large effect may be explained in the context of empathy research. Research demonstrates that partners often disagree about how much pain or disability the partner with pain experiences (Cano et al., 2004; Cano et al., 2005). Spouse anger/contempt might result from misunderstandings that arise from a lack of sense of knowing about the partner's pain (Goubert et al., 2005). High intensity negative affect may block spouses' attempts to understand their partner's pain by generating feelings of resentment or depressive symptoms, both of which may affect the motivation to be empathic. Of course, research is needed to disentangle the temporal relationships between affect, interaction, and mood.

Because this was a preliminary investigation, several methodological issues must be kept in mind. First, recall that the couples engaged in a discussion about a topic of their choice rather than engaging in a pain-related interaction task. Newton-John & Williams (2006) found that couples' satisfaction with pain talk and with general marital interaction were positively correlated. Furthermore, negative interaction is consistent across different types of discussions in non-pain couples (Gottman, 1979). Therefore, the results of this study are expected to generalize to discussions about the impact of pain. However, additional research is needed to determine if marital interaction differs in discussions explicitly about pain compared to other types of discussions. Types of discussions may also vary as a function of the couples' characteristics (e.g., couple pain status). Second, we grounded our work in emotion regulation and empathy models. However, we did not explicitly assess empathy; therefore, other theories may be used to explain the results. Ongoing work in our lab addresses the issue of empathic marital interaction during pain discussions using an observational coding system designed to assess empathic communication. Third, the cross-sectional nature of the study prevented conclusions about directionality or causality. It is likely that the association between interaction and depressive symptoms is bi-directional over time. Sequential and longitudinal analyses may provide additional insight into this matter. Fourth, the sample consisted of heterosexual couples that were self-selected from the community. It remains to be seen if the findings generalize to other pain populations that might be more disabled, depressed, or relationally distressed as well as to other dyads (e.g., same-sex couples). Larger samples are needed to examine demographic variables that may relate to marital interaction including gender, race, and ethnicity. Larger samples may also result in more normally distributed interaction data so that the degree of expressed affect can be examined rather than the presence or absence of affect.

Clearly, there are numerous directions to be pursued in chronic pain couples interaction research. Nevertheless, the current findings provide a first step toward informing theory and research on the importance of affective interaction by building on existing work on spouses' behavioral responses (Romano et al., 1991), perceptions of chronic pain couples' interaction (Newton-John & Williams, 2006), behavior and emotion regulation in couples (Fruzzetti & Iverson, 2006), and empathy (Goubert et al., 2005).

Acknowledgements

The authors wish to thank Nermeen Ezzat El Nokali for her help in conducting this study. The second author was supported by grant K01 MH 066975 while writing this paper.

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Table 1

Bivariate associations among affect codes

	Anger/Contempt	Sadness	Humor
Anger/Contempt	**.30****	.21†	−.21†
Sadness	.33**	**.28***	−.13
Humor	−.18	−.13	**.70*****

Note. N = 78. Bold correlations on the diagonal exhibit associations within couples (i.e., between spouses in the same couple). Correlations between affect codes within persons with pain are displayed above the diagonal whereas correlations within their spouses are displayed below the diagonal.

† $p < .10$.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

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Table 2

T-tests demonstrating association between affect codes, marital satisfaction, pain severity, and depressive symptoms

	Affect Codes					
	Persons with Pain			Spouses		
	Anger/Contempt *t*	**Sadness *t***	**Humor *t***	**Anger/Contempt *t***	**Sadness *t***	**Humor *t***
Marital Satisfaction-Persons with Pain	1.59	−.29	**−2.00***	1.00	.45	−1.72
Marital Satisfaction-Spouses	.45	.90	**−2.22***	1.36	**2.38***	**−2.45***
Depressive Symptoms-Persons with Pain	−.17	−.49	.60	−1.15	−.26	.55
Depressive Symptoms-Spouses	−1.74	−1.53	.74	**−2.59****	**−2.61****	1.07
Pain Severity-Persons with Pain	−.08	−.05	.03	−.57	−.72	−1.11
Pain Severity-Spouse Rating	**−2.22***	−1.00	1.59	−1.36	−1.14	1.60

Note. df = 76 for all analyses except for depressive symptoms, in which case df = 75.

* $p < .05$.

** $p < .01$.

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Table 3

Analysis of Variance: Depressive symptoms in persons with pain

Variable	F[a]	Partial eta^2
Marriage Duration	.17	.00
Education	9.38**	.12
Pain Severity in Person with Pain	13.20***	.17
Marital Satisfaction in Person with Pain	7.81**	.11
Couple Pain Status	5.42*	.08
Sadness in Person with Pain	.28	.00
Sadness in Spouse	1.00	.01
Sadness in Person with Pain X Couple Pain Status	6.09*	.08
Sadness in Spouse X Couple Pain Status	2.07	.03
Sadness in Spouse X Sadness in Person with Pain	1.42	.02

[a] Note. df (1, 66).

* $p < .05$.

** $p < .01$.

*** $p < .001$.

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Table 4

Analysis of Variance: Depressive symptoms in spouses

Variable	F[a]	Partial eta^2
Education	3.41	.05
Marital Satisfaction in Spouse	17.91***	.21
Couple Pain Status	5.23*	.07
Anger/contempt in Spouse	2.64	.04
Anger/contempt in Person with Pain	.38	.00
Anger/contempt in Spouse × Couple Pain Status	4.74*	.06
Anger/contempt in Person with Pain X Couple Pain Status	.03	.00
Anger/contempt in Spouse X Anger/contempt in Person with Pain	3.96†	.05

[a]Note. df (1, 68).

†p < .06.

*p < .05.

**p < .01.

***p < .001.

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Table 5

Analysis of Variance: Pain severity in persons with pain

Variable	F[a]	Partial eta^2
Race/Ethnicity	.00	.00
Marriage Duration	6.34*	.09
Education	8.55**	.11
Couple Pain Status	3.26	.05
Sadness in Spouse	.30	.00
Sadness in Person with Pain	.04	.00
Sadness in Spouse X Couple Pain Status	.08	.00
Sadness in Person with Pain X Couple Pain Status	4.38*	.06
Sadness in Spouse X Sadness in Person with Pain	.07	.00

[a]Note. df (1, 68).

*p < .05.

**p < .01.

***p < .001.

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Table 6

Analysis of Variance: Pain severity in persons with pain

Variable	F[a]	Partial eta^2
Race/ethnicity	.47	.01
Marriage Duration	5.25*	.07
Education	11.39***	.14
Couple Pain Status	.45	.01
Humor in Spouse	5.18*	.07
Humor in Person with Pain	3.53	.05
Humor in Spouse X Couple Pain Status	4.88*	.07
Humor in Person with Pain X Couple Pain Status	1.01	.02
Humor in Spouse X Humor in Person with Pain	.02	.00

[a]Note. df (1, 68).

*p < .05.

**p < .01.

***p < .001.